APPENDIX A
LABORATORY CONFIGURATION AND PERFORMANCE VERIFICATION PROCEDURE FOR SIDE IMPACT DUMMY (SID)

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1. INTRODUCTION

The Side Impact Dummy (SID) shall be used as a tool to determine occupant injury levels experienced during side impact protection compliance tests. The SID is based on the Part 572B test dummy used in FMVSS 208, with several exceptions. The thorax and pelvis have been redesigned to produce human-like acceleration responses in the lateral direction with provisions to mount accelerometers on the ribs, spine and pelvis; a shock absorber between the ribcage and the spine; and a hinge where the ribs attach to the spine. The SID does not have articulating arms or shoulders. The mass of the arms has been incorporated into the mass of the thorax, and urethane foam arms have been added for the appropriate biofidelity characteristics.

2. PURPOSE

The purpose of this SID Configuration and Performance Verification Test Procedure is to provide contractors with standard test procedures for conducting vehicle side impact test usage verification tests so that repetitive and correlative test results can be obtained. The following performance tests have been developed to establish a uniform procedure for all SID users:

A. Thorax lateral impact test

B. Lumbar Spine and Pelvis lateral impact test

In addition, a dummy configuration and chest cavity shock absorber performance test will be conducted for each dummy. See SID figure on next page.

3. APPLICATION

The performance verification test procedure for the SID is intended for use by independent testing laboratories under contract to the NHTSA's Office of Vehicle Safety Compliance (OVSC). The procedure must be used by all OVSC contract laboratories conducting passenger car side impact protection compliance tests per the requirements of FMVSS 214.

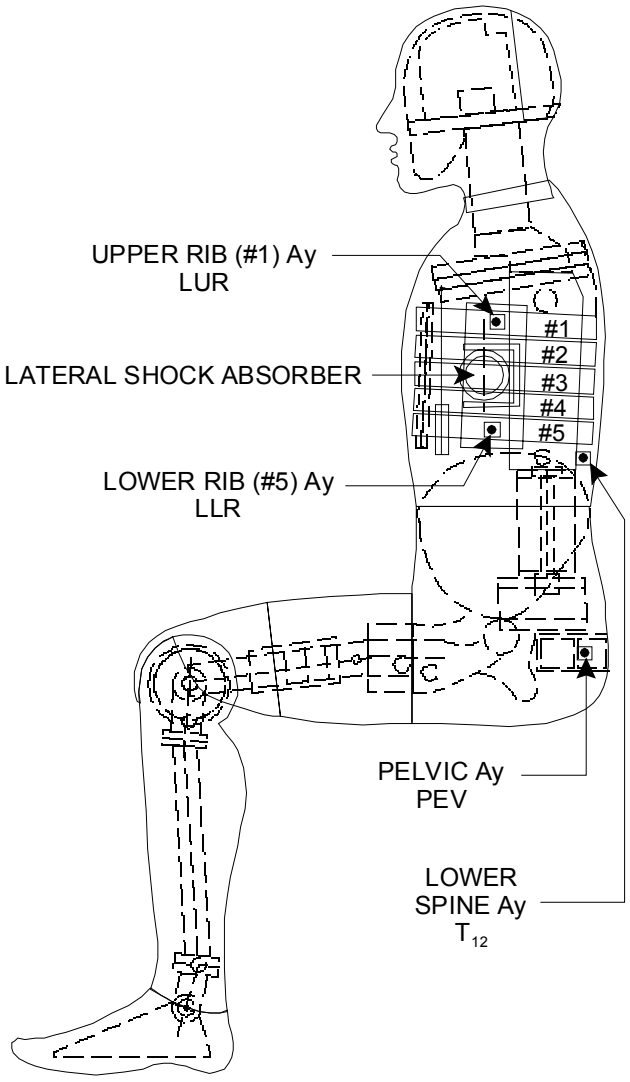
4. GOOD HOUSEKEEPING

OVSC contract laboratories conducting SID configuration and performance verification tests must maintain the entire laboratory area, test fixtures, and instrumentation in orderly and clean condition. Instrumentation used for testing must be displayed in a professional manner and present a good appearance.

5. SECURITY

All OVSC SIDs delivered to the contract laboratory as Government Furnished Property (GFP) must be stored in a safe and secure area such as the dummy configuration and performance verification room. The contractor is responsible for the security of the GFP dummies.

SIDE IMPACT DUMMY



6. TEST SCHEDULING

The SIDs are being subjected to verification testing in order to be utilized in side impact protection compliance tests to measure levels of occupant protection. The schedule for verification tests must be correlated with that of the side impact protection compliance test program.

7. CONTRACTOR'S IN-HOUSE TEST PROCEDURE

Prior to conducting any SID configuration and performance verification tests, the contract laboratory must submit a copy of their detailed in-house procedure to the OVSC COTR for approval. The contractor's procedure shall include a complete list of test equipment to be used along with a glossy 8 by 10-inch black and white photograph of each piece of test equipment in the verification laboratory. Instrumentation accuracy, dates of calibration, check-off sheets, and individual worksheets shall be included in the contractor's procedure.

8. TEST DATA DISPOSITION

All verification test data for each SID shall be maintained in sequence by date during the side impact protection test program and the verification data shall be included in APPENDIX C of each final report for the SIDs used for that particular side impact protection compliance test.

9. REQUIREMENT NONCONFORMANCE

Any indication of SID nonconformance to the calibration performance requirements shall be communicated to the OVSC COTR in order that replacement components can be ordered from the dummy manufacturer(s). It is mandatory that the contractor maintain an adequate inventory of SID components which must be replaced frequently such as molded necks, lumbar spines, head skins, rib wraps, etc. The OVSC COTR will work with the contractor's verification laboratory engineer/technician to insure that a dummy replacement component shortage does not jeopardize the side impact protection compliance test schedule.

10. CALIBRATION OF TEST INSTRUMENTATION

The calibration requirements that are listed in the current Laboratory Procedure No. TP-214D shall apply to verification laboratory instrumentation.

11. INSTRUMENTATION LIST

The following contractor instrument calibration information shall be submitted to the COTR prior to the initiation of the dynamic side impact test program. This should include contractor SID accelerometers along with laboratory instruments.

A. Manufacturer's name

B. Instrument Model Number

C. Instrument Serial Number

D. Date of last calibration

E. Date of next calibration

12. STILL PHOTOGRAPHS

Two sets of the following 8 by 10-inch glossy black and white (color is optional) photographs shall be submitted to the COTR with the contractor's in-house verification test procedure prior to initiation of the side impact protection compliance test program at the laboratory.

A. Thorax Impact Test setup

B. Lumbar Spine and Pelvis Impact Test setup

C. Chest Shock Absorber Test setup

D. SID in "upright seated position" with the following views:

(1) Front View

(2) Left Side View

(3) Right Side View

(4) Rear View

E. Top view of SID chest cavity with outer skin removed

F. Overall view of instrumentation used for dummy configuration and performance verification tests.

13. GENERAL DESCRIPTION OF SID

A. The SID consists of component parts and component assemblies (SA-SID-M001 and SA-SID-M001A) which are described in approximately 250 drawings and specifications and listed in the Side Impact Dummy (SID) User's Manual, dated July 1990.

B. The structural properties of the SID are such that the dummy conforms to the requirements of this subpart in every respect both BEFORE and AFTER being used in side impact protection compliance tests.

C. Disassembly, inspection, and assembly procedures; external dimensions and weight; and a dummy drawing list are set forth in the SID User's Manual (July 1990).

14. GENERAL TEST CONDITIONS

A. Performance pretests of the assembled SID are separated in time by a period of not less than 20 minutes unless otherwise specified.

B. Surfaces of the SID components are not painted.

C. Limb joints of the SID are set at the force between 1 and 2 g's, which just supports the limbs' weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2 g's throughout the range of limb motion.

D. SID performance tests are conducted at any temperature from 18.9EC (66EF) to 25.5 EC (78EF) and at any relative humidity from 10 percent to 70 percent after exposure of the dummy to these conditions for a period of not less than 4 hours.

15. UPRIGHT SEATED POSITION FOR SID

For the performance of the thorax and lumbar spine/pelvis tests, the SID is positioned as follows:

A. The dummy is placed on a flat, rigid, clean, dry, horizontal smooth aluminum surface (see figure on next page) whose length and width dimensions are not less than 407 mm (16 inches), so that the SID's midsagittal plane is vertical and centered on the test surface. The SID's torso is positioned to meet the requirements of the thorax and lumbar spine/pelvis test. The seating surface is without the back support and the SID is positioned so that it's midsagittal plane is vertical and centered on the seat surface.

B. The legs are positioned so that their centerlines are in planes parallel to the midsagittal plane.

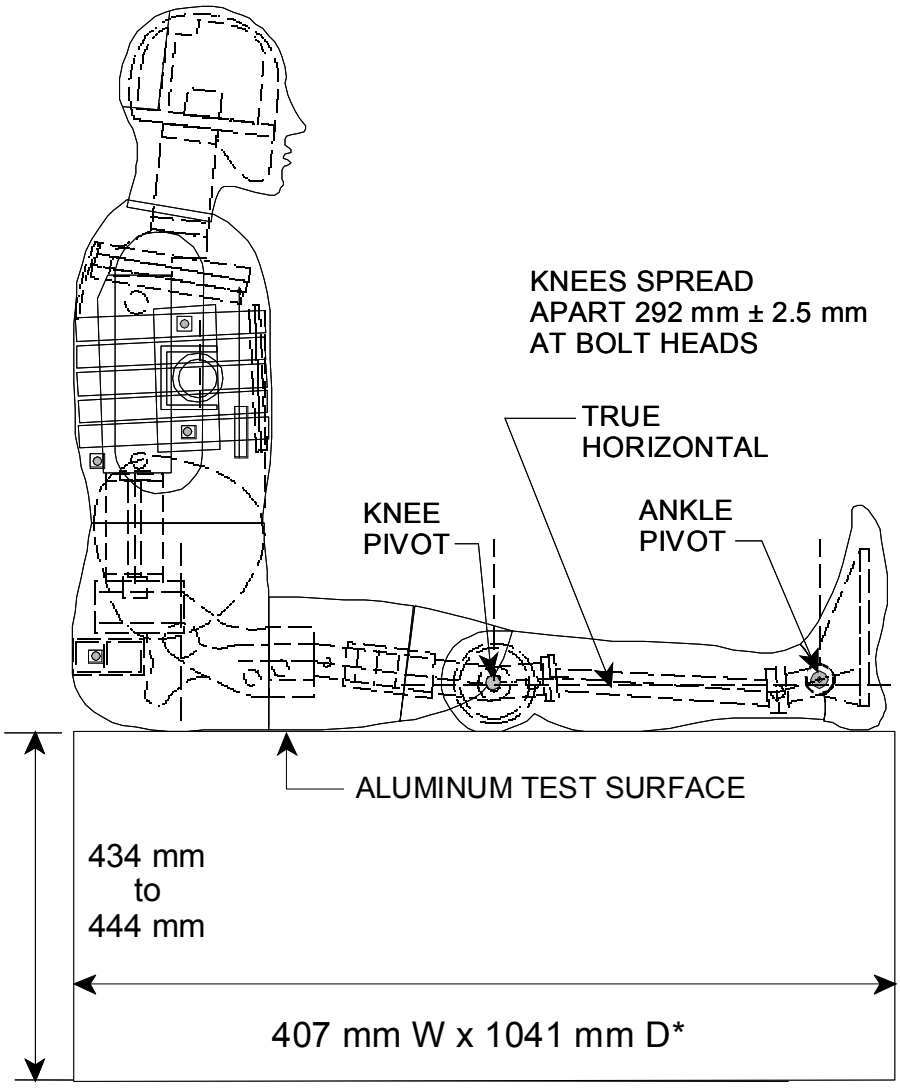
C. The SID's pelvis is adjusted so that the upper surface of the lumbar-pelvic adaptor is horizontal.

D. The upper legs are positioned symmetrically about the midsagittal plane so that the distance between the knee pivot bolt heads is 290 mm ± 2.5 mm (11.5" ± 0.1").

E. Orient both the left and right femurs by positioning the centerline of the ½-13 shoulder bolt attaching the upper leg bone to the femur assembly horizontal and perpendicular to the midsagittal plane within one degree.

F. The lower legs are positioned straight forward and in planes parallel to the midsagittal plane so that the lines between the midpoint of the knee pivots and the ankle pivots are horizontal.

15. UPRIGHT SEATED POSITION FOR SID



* This dimension must be at least 407 mm

FIGURE 2

16. SID CONFIGURATION VERIFICATION TESTING

A. Place the SID in the Upright Seated Position except that the legs are positioned in the vertical plane as shown on the next page.

B. Adjust and secure the head so that its occiput is 43 mm (1.7") forward of the transverse vertical plane with the vertical mating surface of the skull with its cover parallel to the transverse vertical plane.

C. Adjust and secure the thorax so that the rear surface of the upper thoracic spine accelerometer (T_1) mounting surface is inclined 3 degrees forward of the vertical.

D. Measure the seated height from the seating surface to the uppermost point on the head-skin surface.

E. Measure the H-Point locations from the seating surface to the center of the holes in the pelvis flesh covering in line with the hip motion ball.

F. Measure the knee pivot distance from the backline to the center of the knee pivot bolt head.

G. Measure the knee pivot distance from the floor surface from the center of the knee pivot bolt head to the bottom of the heel when the SIDs foot is horizontal and pointing forward.

H. Measure the hip width at the widest point of the pelvic section.

All configuration data shall be presented on the data sheet which follows.

16. SID CONFIGURATION VERIFICATION TESTING....Continued

SID CONFIGURATION SETUP

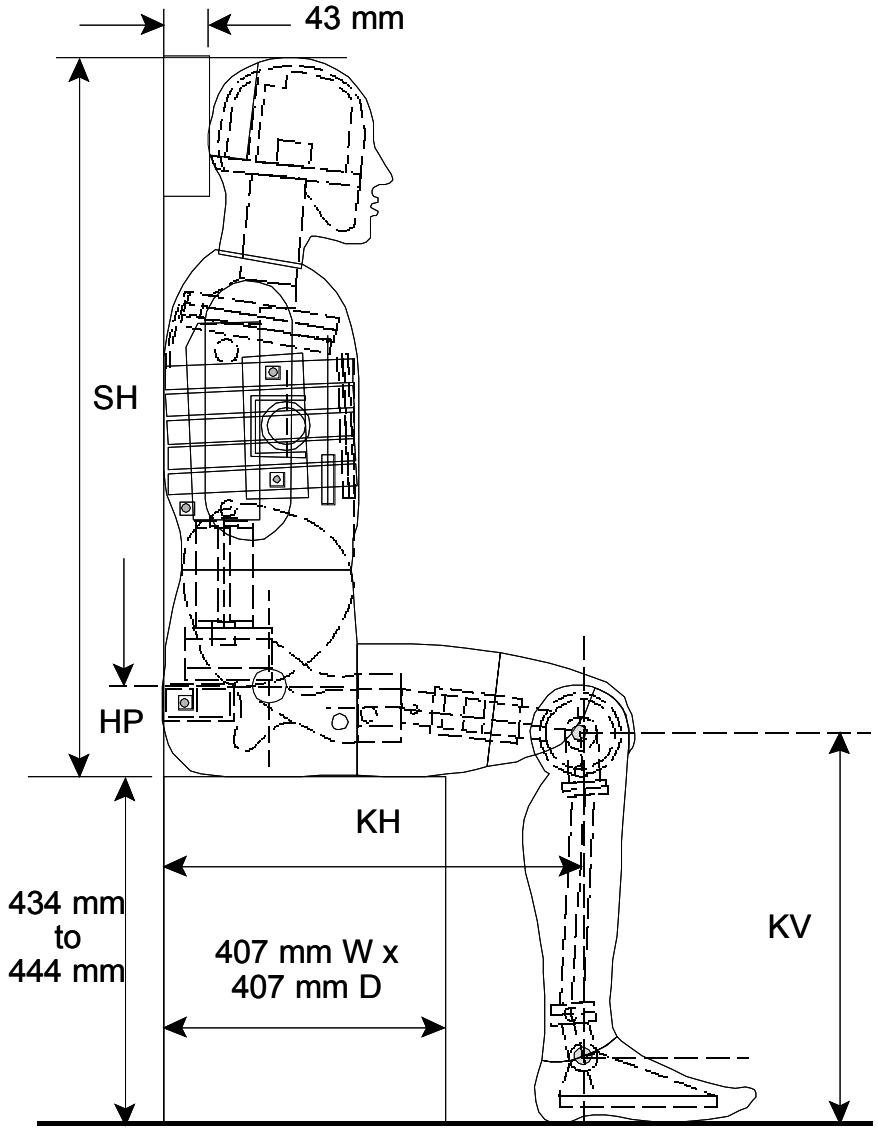


FIGURE 3

16. SID CONFIGURATION VERIFICATION TESTING....Continued

SID WITH CHEST FLESH INSTALLED

NHTSA DUMMY I.D. NUMBER:

DATE OF CONFIGURATION VERIFICATION:

SEQUENTIAL VERIFICATION NUMBER FOR DUMMY:
(Sequential number beginning with "1" at the start of each fiscal year's crash test program)

TECHNICIAN:

		PART 572F SPECIFICATION	PRETEST	POST TEST
SH	SEATED HEIGHT	889 mm - 909 mm 35.0" to 35.8"		
HP	HIP PIVOT HEIGHT	99 mm 3.9" Ref.		
KH	KNEE PIVOT FROM BACK LINE	511 mm - 526 mm 20.1" to 20.7"		
KV	KNEE PIVOT FROM FLOOR	490 mm - 505 mm 19.3" to 19.9"		
HW	HIP WIDTH	356 mm - 391 mm 14.0" to 15.4"		

REMARKS:

16. SID CONFIGURATION VERIFICATION TESTING....Continued

SID CONFIGURATION SETUP

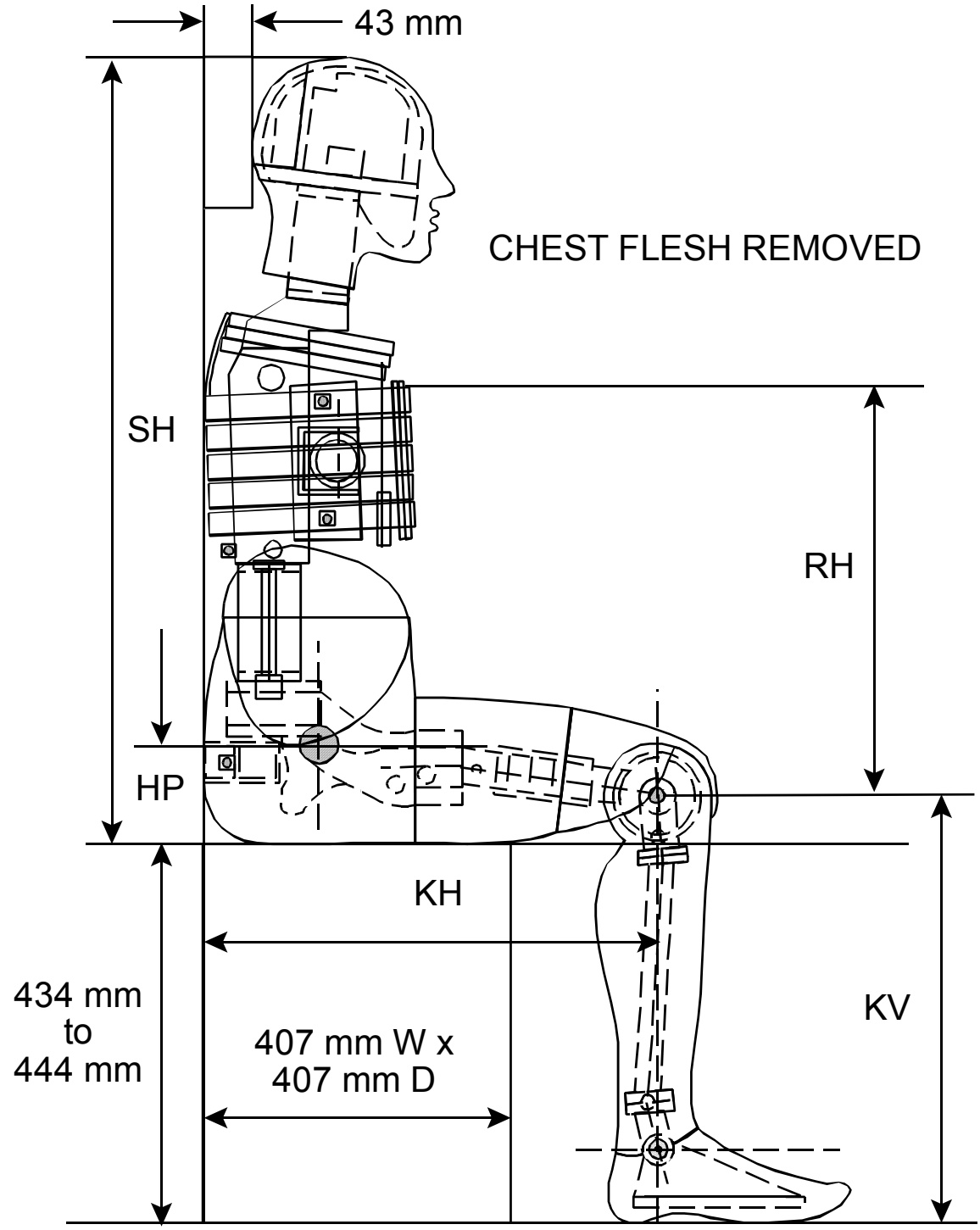


Figure 4

16. SID CONFIGURATION VERIFICATION TESTING....Continued

SID WITH CHEST FLESH REMOVED

NHTSA DUMMY I.D. NUMBER:

DATE OF CONFIGURATION VERIFICATION:

SEQUENTIAL VERIFICATION NUMBER FOR DUMMY:
(Sequential number beginning with "1" at the start of each fiscal year's crash test program)

TECHNICIAN:

		PART 572F SPECIFICATION	PRETEST	POST TEST
SH	SEATED HEIGHT	889 mm -909 mm 35.0" to 35.8"		
HP	HIP PIVOT HEIGHT	99 mm 3.9" Ref.		
KH	KNEE PIVOT FROM BACK LINE	511 - 526 20.1" to 20.7"		
RH	RIB HEIGHT	502 mm - 520 mm 19.75" to 20.50"		
KV	KNEE PIVOT FROM FLOOR	490 mm - 505 mm 19.3" to 19.9"		
HW	HIP WIDTH	356 mm - 391 mm 14.0" to 15.4"		

REMARKS:

17. SID ACCELEROMETER REQUIREMENTS

Uniaxial Y-direction accelerometers shall be mounted in each of the following locations:

A. Chest cavity upper rib

B. Chest cavity lower rib

C. Chest cavity lower spine

D. Pelvic assembly

The outputs of the accelerometers shall be recorded in individual data channels. The impact pendulum accelerations shall conform to SAE J211 (1980) with a channel class of 60. The pelvis and chest accelerations must conform to a Finite Impulse Response (FIR) filter with a passband frequency of 100 Hz, a step band frequency of 189 Hz, a passband ripple of 0.0225 db, and a step band gain of -50 db (FIR 100).

A. The chest cavity Y-Acceleration peak response range requirements are as follows (FIR based numbers):

   (1) Chest cavity upper rib Y-Acceleration – 37 to 46 g's

   (2) Chest cavity lower rib Y-Acceleration – 37 to 46 g's

   (3) Chest cavity lower spine Y-Acceleration – 15 to 22 g's

B. The pelvis Y-Acceleration peak response range requirement is as follows:

   Pelvis Y-Acceleration -- 40 to 60 g's

17. SID ACCELEROMETER REQUIREMENTS....Continued

SID # TEST PARAMETERS	PART 572F SPECIFICATION	PRETEST CALIBRATION	POST TEST CALIBRATION
THORAX IMPACT TEST			
Upper Rib Accel.	37 - 46 g's		
Lower Rib Accel.	37 - 46 g's		
Lower Spine Accel.	15 - 22 g's		
PELVIC IMPACT TEST			
Pelvic Accel.	40 - 60 g's		

REMARKS:

18. SID PERFORMANCE VERIFICATION TESTING

The SID shall conform with all test conditions and performance requirements as follows:

A. THORAX

(1) Three accelerometers are mounted in the thorax for measurement of lateral accelerations with each accelerometer's sensitive axis aligned to be closely perpendicular to the thorax's midsagittal plane. The accelerometers are mounted in the following locations:

(A) One accelerometer is mounted on the Thorax to Lumbar Adaptor (SID-005) by means of a T_{12} Accelerometer Mounting Platform (SID-009) and T_{12} Accelerometer Mount (SID-038) with its seismic mass center at any distance up to 10 mm (0.4") from a surface point on the Thorax to Lumbar Adaptor where two perpendicular planes aligned with the adaptor's vertical and horizontal center lines intersect.

(B) Two accelerometers are mounted, one on the top and the other at the bottom part of the Rib Bar (SID-024) on the struck side. Their seismic mass centers are at any distance up to 10 mm (0.4") from a point on the Rib Bar surface located on its longitudinal centerline 19 mm (0.75") from the top for the top accelerometer and 19 mm (0.75") from the bottom, for the bottom accelerometer.

When the thorax of a completely assembled SID (SA-SID-M001A), appropriately assembled for RIGHT or LEFT side impact, is impacted (see figure on next page) by a test probe, specified in the next paragraph, at 4.27 m/s ± 0.06 m/s (14 feet per second (fps), ± 0.2 fps), the peak accelerations at the locations of the accelerometers mounted on the thorax are as follows in items (A), (B) and (C).

The test probe used for lateral thoracic and pelvis impact tests is a 152.4 mm ± 0.25 mm (6 ± 0.01") diameter cylinder that weighs 23.36 kg ± 0.02 kg (51.5 lb ± 0.05 lb) including instrumentation. Its impacting end has a flat right angle face that is rigid and has an edge radius of 13 mm (0.5").

18. SID PERFORMANCE VERIFICATION TESTING....Continued

(A) For the lower thoracic spine (T_{12}) not less than 15 g's and not more than 22 g's.

(B) For the accelerometer at the top of the Rib Bar on the struck side (LUR for left side or RUR for right side) not less than 37 g's and not more than 46 g's.

(C) For the accelerometer at the bottom of the Rib Bar on the struck side (LLR for left side or RLR for right side) not less than 37 g's and not more than 46 g's.

(2) Test Procedure.

(A) Adjust the dummy legs as follows:

Limb joints of the test dummy are set at the force between 1 and 2 g's, which just supports the limbs' weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2 g's throughout the range of limb motion. See Section 1.8 on page 11 of SID Users Manual for more details.

Seat the dummy on a seating surface as follows with the limbs extended horizontally forward.

(i) The dummy is placed on a flat, rigid, clean, dry, horizontal smooth aluminum surface whose length and width dimensions are not less than 407 mm (16"), so that the dummy's midsagittal plane is vertical and centered on the test surface. The dummy's torso is positioned to meet the requirements of Sections A and B (from Section 15 "Upright Seated Position for SID"). The seating surface is without the back support and the test dummy is positioned so that the dummy's midsagittal plane is vertical and centered on the seat surface.

(ii) The legs are positioned so that their centerlines are in planes parallel to the midsagittal plane.

18. SID PERFORMANCE VERIFICATION TESTING....Continued

(iii) Performance pretests of the assembled dummy are separated in time by a period of not less than 20 minutes unless otherwise specified.

(B) Place the longitudinal centerline of the test probe at the lateral side of the chest at the intersection of the centerlines of the THIRD rib and the Rib Bar on the desired side of impact. This is the left side if the dummy is to be used on the driver's side of the vehicle and the right side if the dummy is to be used on the passenger side of the vehicle. The probe's centerline is perpendicular to thorax's midsagittal plane.

(C) Align the test probe so that its longitudinal centerline coincides with the line formed by the intersection of the transverse and frontal planes perpendicular to the chest's midsagittal plane passing through the designated impact point.

(D) Position the SID as previously specified in Section (A)(from Section 15 "Upright Seated Position for SID"), so that the thorax's midsagittal plane and tangential plane to the Hinge Mounting Block (Drawing SID-034) are vertical.

(E) Position the dummy such that the ribs are level horizontally (fore and aft, ± 1 deg.) and the midsagittal plane (as measured from the SID's ribs) of the dummy is vertical and perpendicular (± 1 deg) to the probes centerline.

(F) Impact the thorax with the test probe so that at the moment of impact at the designated impact point, the probe's longitudinal centerline falls within 2 degrees of a horizontal line perpendicular to the dummy's midsagittal plane and passing through the designated impact point.

(G) Guide the probe during impact so that it moves with no significant lateral, vertical or rotational movement.

(H) Allow a time period of at least 20 minutes between successive tests of the chest.

18. SID PERFORMANCE VERIFICATION TESTING....Continued

LEFT SIDE CHEST LATERAL IMPACT TEST SETUP

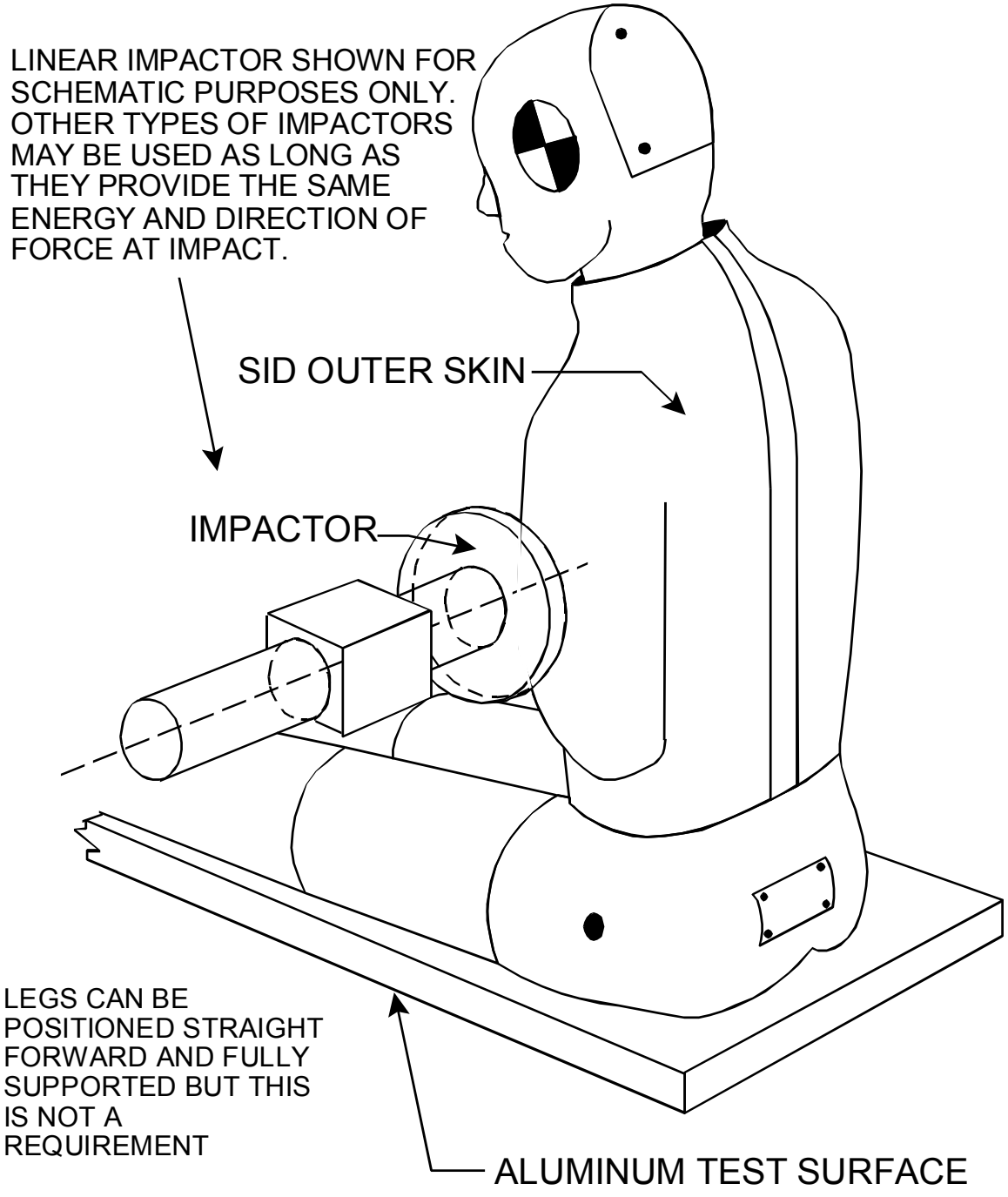
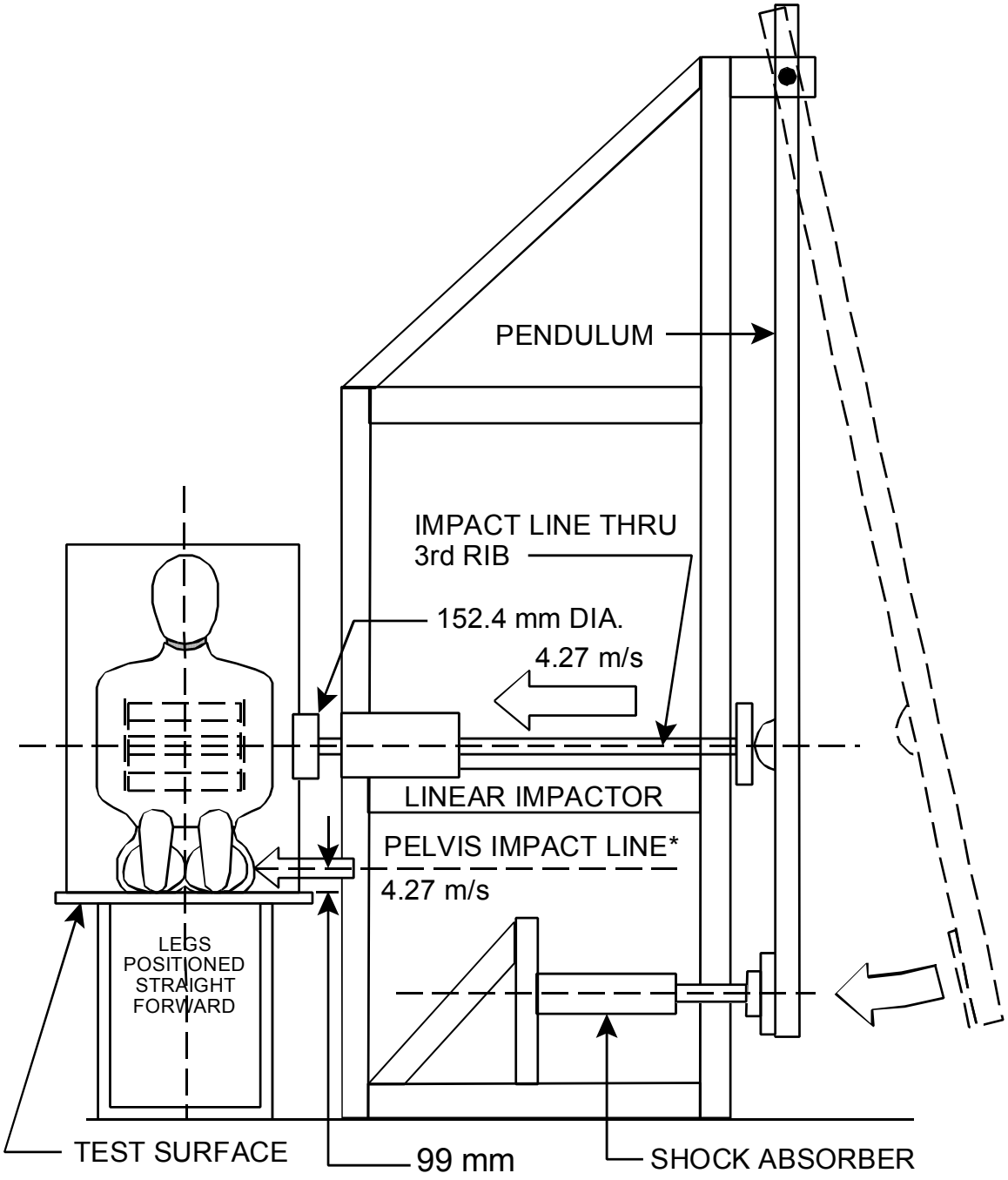


Figure 5

18. SID PERFORMANCE VERIFICATION TESTING....Continued

SID LINEAR IMPACTOR



FRONT VIEW OF SID

* LINE IS 122 mm FORWARD OF TEST SURFACE VERTICAL BACK

FIGURE 6

18. SID PERFORMANCE VERIFICATION TESTING....Continued

B. LUMBAR SPINE AND PELVIS

(1) The pelvis of a fully assembled SID (SA-SID-M001A) shall be impacted laterally by a test probe conforming to the following specifications:

The test probe used for lateral thoracic and pelvis impact tests is a 152.4 mm ± 0.25 mm (6" ± 0.01") diameter cylinder that weighs 23.36 kg ± 0.02 kg (51.5 lb ± 0.05 lb) including instrumentation. Its impacting end has a flat right angle face that is rigid and has an edge radius of 13 mm (0.5").

An accelerometer shall be mounted in the pelvis cavity as follows:

One uniaxial accelerometer is mounted in the pelvis for measurement of the lateral acceleration with its sensitive axis perpendicular to the pelvic midsagittal plane. The accelerometer is mounted on the rear wall of the instrument cavity (Drawing SID-087), with its seismic mass center located up to 8 mm (0.30") from the point, 23 mm (0.90") upward and 13 mm (0.50") to the left of the mounting bolt centerline and 10 mm to 13 mm (0.40" to 0.50") rearward of the rear wall of the instrument cavity.

When the pelvis is impacted laterally at 4.27 m/s ± 0.06 m/s (14 fps ± 0.2 fps), in accordance with paragraph (2) of this section, the peak acceleration at the location of the accelerometer mounted in the pelvis cavity shall be not less than 40 g's and not more than 60 g's. The acceleration-time (a-t) curve for the test shall be unimodal and shall lie at or above the + 20 g level for an interval not less than 3 milliseconds (ms) and not more than 7 ms. See EXAMPLE of TYPICAL curve on next page.

18. SID PERFORMANCE VERIFICATION TESTING....Continued

(2) Test Procedure

(A) Adjust the dummy legs as follows:

Limb joints of the test dummy are set at the force between 1 and 2 g's, which just supports the limbs' weight when the limbs are extended horizontally forward. The force required to move a limb segment does not exceed 2 g's throughout the range of limb motion. (Details - see Sect. 1.8 on page 11 of SID users manual).

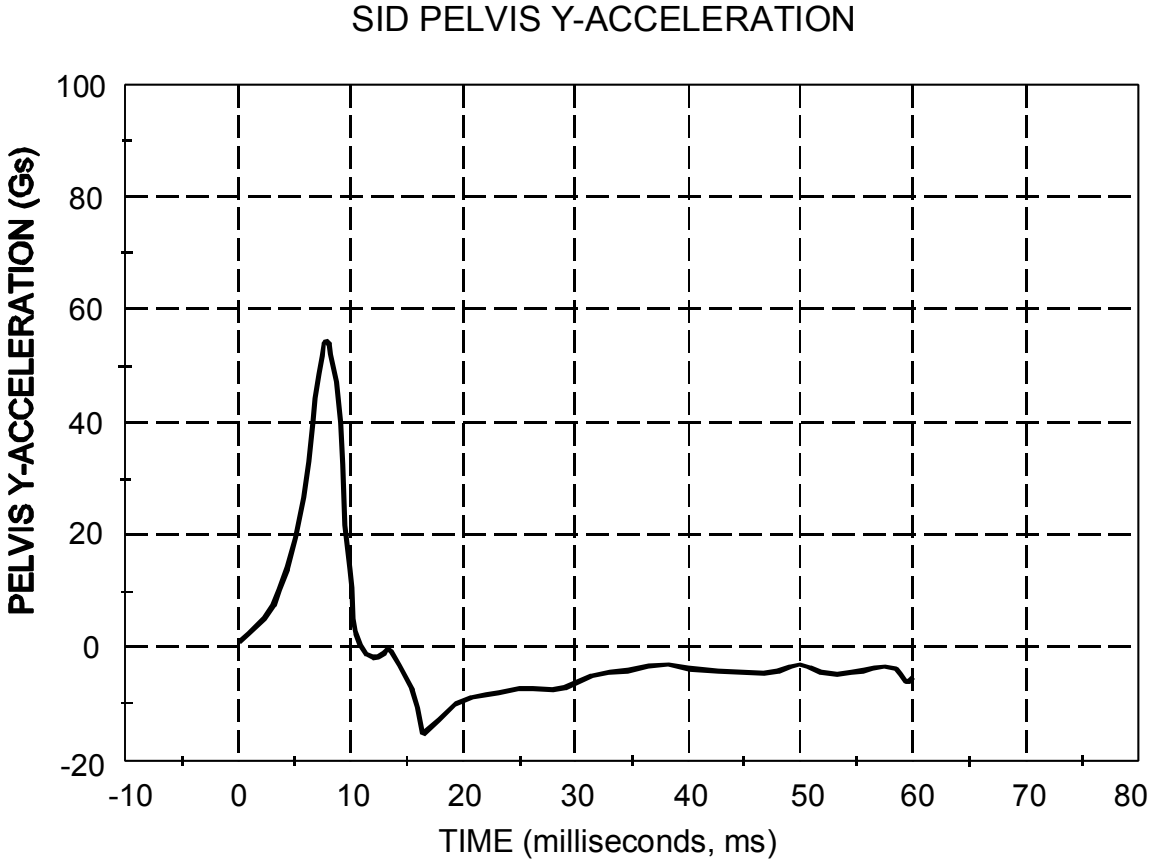


FIGURE 7

18. SID PERFORMANCE VERIFICATION TESTING....Continued

Seat the dummy on a seating surface as follows with the limbs extended horizontally forward.

(i) The dummy is placed on a flat, rigid, clean, dry, horizontal smooth metal surface whose length and width dimensions are not less than 407 mm (16"), so that the dummy's midsagittal plane is vertical and centered on the test surface. The dummy's torso is positioned to meet the requirements of Sections A and B. The seating surface is without the back support and the test dummy is positioned so that the dummy's midsagittal plane is vertical and centered on the seat surface.

(ii) The legs are positioned so that their centerlines are in planes parallel to the midsagittal plane.

(iii) Performance pretests of the assembled dummy are separated in time by a period of not less than 20 minutes unless otherwise specified.

(B) Place the longitudinal centerline of the test probe at the lateral side of the pelvis at a point 99 mm ± 1 mm (3.9" ± 0.04") vertical from the seating surface and 122 mm ± 1 mm (4.8" ± 0.04") ventral to a transverse vertical plane which is tangent to the back of the dummy's buttocks.

(C) Align the test probe so that at impact its longitudinal centerline coincides with the line formed by intersection of the horizontal and vertical planes perpendicular to the midsagittal plane passing through the designated impact point.

(D) Adjust the SID so that its midsagittal plane is vertical and the rear surfaces of the thorax and buttocks are tangent to a transverse vertical plane.

(E) Orient both the left and right femurs by positioning the centerline of the ½-13 Shoulder Bolt attaching the upper leg bone to the femur assembly horizontal and perpendicular to the midsagittal plane within one degree.

18. SID PERFORMANCE VERIFICATION TESTING....Continued

(F) Impact the pelvis with the test probe so that at the moment of impact the probe's longitudinal centerline falls within 2 degrees of the line specified as follows:

Align the test probe so that its longitudinal centerline coincides with the line formed by the intersection of the transverse and frontal planes perpendicular to the chest's midsagittal plane passing through the designated impact point.

(G) Guide the test probe during impact so that it moves with no significant lateral, vertical or rotational movement.

(H) Allow a time period of at least 2 hours between successive tests of the pelvis.

C. INSTRUMENTATION AND TEST CONDITIONS

(1) The test probe used for lateral thoracic and pelvis impact tests is a 152.4 mm ± 0.25 mm (6" ± 0.01") diameter cylinder that weighs 23.36 kg ± 0.02 kg (51.5 lb ± 0.05 lb) including instrumentation. Its impacting end has a flat right angle face that is rigid and has an edge radius of 13 mm (0.5").

(2) Three accelerometers are mounted in the thorax for measurement of lateral accelerations with each accelerometer's sensitive axis aligned to be perpendicular to the thorax's midsagittal plane. The accelerometers are mounted in the following locations:

(A) One accelerometer is mounted on the Thorax to Lumbar Adaptor (SID-005) by means of a T_{12} Accelerometer Mounting Platform (SID-009) and T_{12} Accelerometer Mount (SID-038) with its seismic mass center at any distance up to 10 mm (0.4") from a surface point on the Thorax to Lumbar Adaptor where two perpendicular planes aligned with the adaptor's vertical and horizontal center lines intersect.

18. SID PERFORMANCE VERIFICATION TESTING....Continued

(B) Two accelerometers are mounted, one on the top and the other at the bottom of the Rib Bar (SID-024) on the struck side. Their seismic mass centers are at any distance up to 10 mm (0.4") from a point on the Rib Bar surface located on its longitudinal centerline 19 mm (0.75") from the top for the top accelerometer and 19 mm (0.75") from the bottom, for the bottom accelerometer.

(3) One uniaxial accelerometer is mounted in the pelvis for measurement of the lateral acceleration with its sensitive axis perpendicular to the pelvic midsagittal plane. The accelerometer is mounted on the rear wall of the instrument cavity (Drawing SID-087), with its seismic mass center located up to 8 mm (0.30") from the point, 23 mm (0.90") upward and 13 mm (0.50") to the left of the mounting bolt centerline and 10 mm to 13 mm (0.40" to 0.50") rearward of the rear wall of the instrument cavity.

(4) Instrumentation and sensors used must conform to the SAE J-211 (1988) recommended practice requirements. The outputs of the accelerometers installed in the dummy are then processed with the software for the Finite Impulse Response (FIR) filter (FIR 1 00 software). The FORTRAN program for this FIR 100 software (FIR 100 Filter Program, Version 1.0, July 16, 1990) is incorporated by reference in 572.40 of the rule. The data are processed in the following manner:

A. Analog data recorded in accordance with SAE J-211 (1988) recommended practice channel class 1000 specification

B. This data is then filtered with the FIR 100 Filter Program (Version 1.0, July 16, 1990).

(1) FIR 100 Filter does the following:

A. Filters the data with a 300 Hz, SAE Class 180 filter

B Subsamples the data to a 1600 Hz sampling rate

18. SID PERFORMANCE VERIFICATION TESTING....Continued

C. Removes the bias from the subsampled data

(2) FIR 100 Filter Program has the following characteristics:

A. Passband frequency – 100 Hz

B. Stopband frequency – 189 Hz

C. Stopband gain – 50 db

D. Passband ripple – 0.0225 db

(5) The mountings for the spine, rib and pelvis accelerometers shall have no resonance frequency within a range of 3 times the frequency range of the applicable channel class.

19. BENCH TEST PROCEDURE FOR CHEST SHOCK ABSORBER

The following procedure is provided for the bench test.

FILLING AND BLEEDING PROCEDURE FOR THE SID THORACIC SHOCK ABSORBER

The SID thoracic shock absorber is manufactured by ACE Controls Inc. (or any shock absorber that fulfills performance requirements) and is specified as

HA - l/2 x 2-Z ACE Primary Series Linear Decelerator non-adjustable with full open orifices and a double shaft seal

The following industrial oils may be used to fill the shock absorber. Oils from different manufacturers should not be mixed.

American Industrial Oil #46
AMOCO-Dexron Automatic Transmission Fluid
Texaco Regal 46

19. BENCH TEST PROCEDURE FOR CHEST SHOCK ABSORBER..Continued

The following draining, flushing, filling, and bleeding procedure should be performed before a shock absorber is bench tested to check performance. If the oil to be used in bleeding the unit is the same as the oil already in the unit, it is not necessary to drain and flush the shock absorber.

A. Remove the spring retainer screw, the spring retainer, and the spring from the shaft.

B. Replace the retainer and the retainer screw.

C. Remove the drain plug (socket head) and the bleed screw from the shock absorber body.

D. Drain the oil from the unit.

E. Check the bleed hole to see if it is clear. If there is black foam blocking the hole, the unit must be disassembled and the foam moved out of the way. See the ACE Controls Installation, Maintenance and Repair Manual for disassembling instructions.

F. Screw a stand pipe and reservoir into the drain plug opening. A short nipple with a pipe thread on one end and a small cup (approximately 50 mm in diameter and 50 mm high) soldered to the other end is satisfactory.

G. Fill the cup with clean oil and stroke the piston several times until oil is flowing freely out of the bleed hole. Remove the cup and drain the oil from the shock absorber. Repeat this flushing three times.

H. Replace the cup and refill it with clean oil. Stroke the unit several times until oil is flowing freely out of the bleed hole. With the piston fully stroked, place a thumb or finger tightly over the bleed hole and draw the piston out slowly. Oil will be drawn in through the stand pipe. Remove the finger and push the piston in slowly forcing oil and air bubbles out of the bleed hole. Be sure there are no air bubbles or contaminants in the reservoir or they will be drawn into the unit. Keep the reservoir full of clean oil. Never pull the shaft out without tightly covering the bleed hole or air will be drawn into the unit. Continue stroking the shock absorber slowly until no air bubbles can be seen emerging from the bleed hole. Even very small bubbles must be eliminated.

19. BENCH TEST PROCEDURE FOR CHEST SHOCK ASORBER....Continued

I. Push the piston all the way in and then, without covering the bleed hole, pull the piston out very slowly so that oil continues to flow out of the bleed hole and air is not sucked into the unit. This is best accomplished by rotating the shaft back and forth while gently pulling.

J. Replace the plug and bleed screw with the piston in the full out position.

K. Replace the spring.

L. Bench test the shock absorber.

BENCH TEST PROCEDURE FOR CHEST SHOCK ABSORBER

A. All air must be bled from shock absorber since air in the system greatly effects resistive force.

B. Data to be recorded is as follows:

(1) Resisting force

(2) Shock piston displacement

(3) Pendulum acceleration

(4) Shock piston velocity

(5) Time

C. Nominal impact velocities shall be 3.05,4.27,6.10 m/s (10, 14 and 20 fps).

D. A typical schematic of shock absorber test setup is shown on the next page. For specific details, refer to drawing number SID-083 (sheets 1 and 2).

19. BENCH TEST PROCEDURE FOR CHEST SHOCK ABSORBER....Continued

SHOCK ABSORBER TEST EQUIPMENT

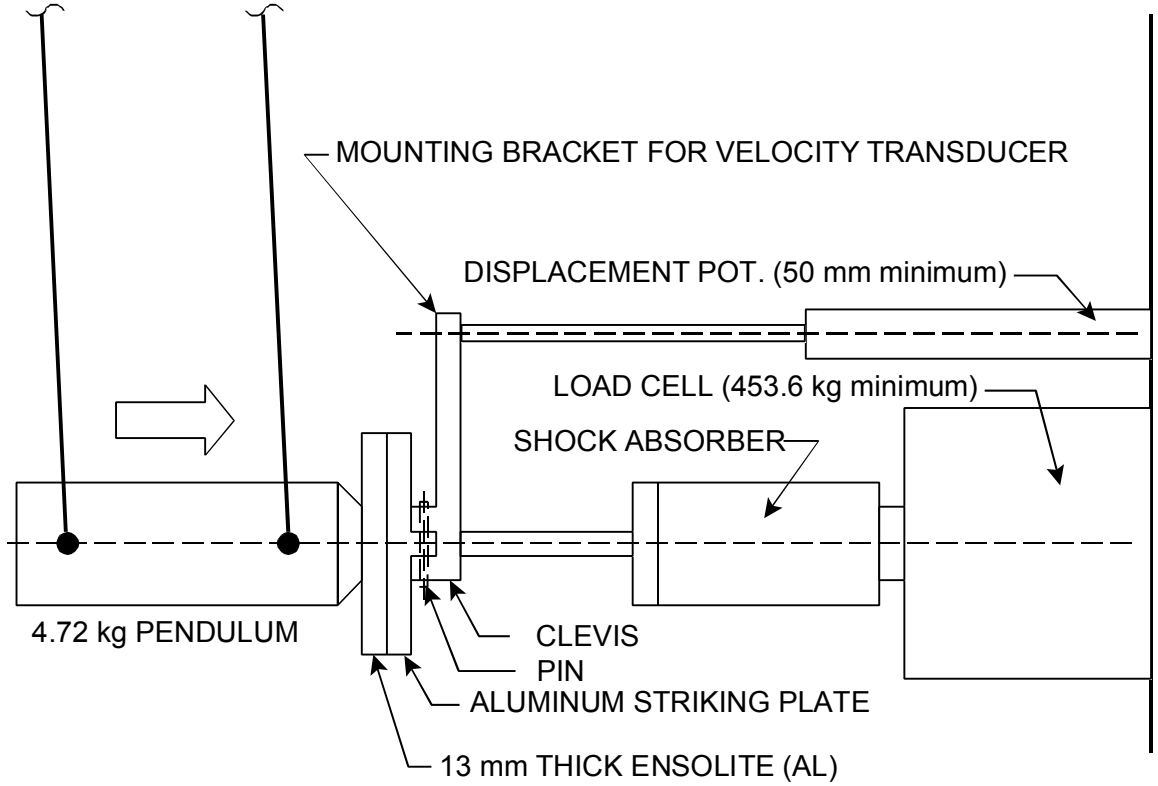


FIGURE 8

19. BENCH TEST PROCEDURE FOR CHEST SHOCK ABSORBER....Continued

E. Tested units must meet specifications shown in Figure 9:

SPECIFICATIONS FOR SHOCK ABSORBER PERFORMANCE

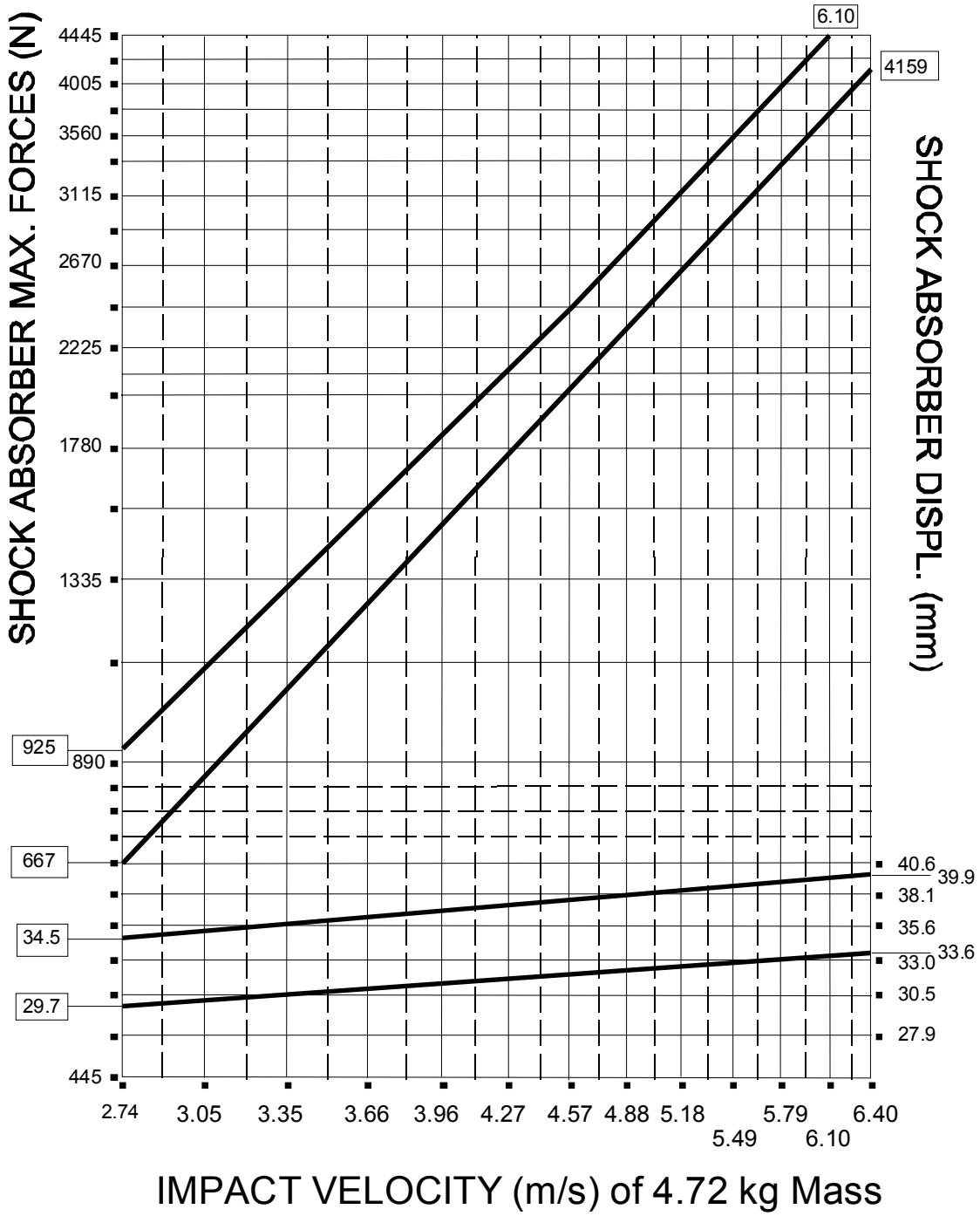


FIGURE 9

20. VERIFICATION TEST DATA SUMMARY SHEET

A test data summary sheet shall be provided (see page 14 for example).

The data sheet will include the following:

Thorax Lateral Impact Test Data

Lumbar Spine and Pelvis Lateral Impact Test Data

21. CHEST CAVITY SHOCK ABSORBER BENCH TEST

VERIFICATION DATA

One data sheet for each of the two SIDs used in each side impact protection test (front occupant and rear occupant).